

CLAIMS

- 1 1. An X-ray source, comprising:
2 an X-ray tube that emits X-rays in response to a current control signal;
3 an X-ray detector that detects X-rays emitted from said X-ray tube and provides a
4 detected X-ray signal indicative thereof; and
5 a control system that receives said detected X-ray signal and provides said current control
6 signal.
- 1 2. The source of claim 1, wherein said X-ray detector comprises a photodiode.
- 1 3. The source of claim 1, wherein said X-ray detector comprises a pin diode.
- 1 4. The source of claim 1, wherein said X-ray detector comprises an ionization detector.
- 1 5. The source of claim 1, wherein said X-ray detector comprises a scintillation detector.
- 1 6. The source of claim 1, wherein said X-ray detector comprises an electron multiplier.
- 1 7. The source of claim 1, wherein said X-ray detector comprises a charge-coupled device.
- 1 8. The source of claim 1, wherein said X-ray tube comprises an X-ray window through
2 which the X-rays pass, and said X-ray detector is positioned directly adjacent to said X-ray
3 window.
- 1 9. The source of claim 8, wherein said X-ray detector partially covers said X-ray window.
- 1 10. The source of claim 1, wherein said X-ray tube comprises an X-ray window through
2 which the X-rays pass, wherein said X-ray detector comprises an X-ray transmissive device that
3 completely covers said X-ray window to sense X-ray flux passing through said X-ray window.

1 11. The source of claim 1, wherein said X-ray detector comprises a segmented X-ray
2 detector.

1 12. The source of claim 1, wherein said X-ray tube comprises an X-ray window through
2 which the X-rays pass, wherein said X-ray window comprises an outside surface, and X-ray
3 detector is located at a distance up to about 3 mm from said outside surface of said X-ray
4 window.

1 13. The source of claim 12, wherein said X-ray detector comprises a photodiode mounted
2 within a light tight package.

1 14. An X-ray tube control system that provides a current control signal to an X-ray tube,
2 comprising:

3 an X-ray detector that detects X-rays emitted from the X-ray tube and provides a detected
4 signal indicative thereof; and

5 a current control system that receives said detected signal and compares said detected
6 signal against a reference value to generate the current control signal.

1 15. The control system of claim 14, wherein said X-ray detector comprises a photodiode.

1 16. The control system of claim 14, wherein said X-ray detector comprises a pin diode.

1 17. The control system of claim 14, wherein said X-ray detector comprises an electron
2 multiplier.

1 18. The control system of claim 14, wherein said X-ray detector comprises a charge-coupled
2 device.

1 19. The control system of claim 14, wherein said X-ray detector is positioned directly
2 adjacent to said X-ray tube.

1 20. The control system of claim 14, wherein said X-ray detector partially covers an X-ray
2 window of the X-ray tube.

1 21. The control system of claim 14, wherein said X-ray detector is an X-ray transmissive
2 device that covers an X-ray window of the X-ray tube to sense X-ray flux from the X-ray
3 window.

1 22. The control system of claim 14, wherein said X-ray detector comprises a segmented X-
2 ray detector that is mounted adjacent to a cooperating segmented X-ray filter.

1 23. The control system of claim 21, wherein said X-ray detector comprises a photodiode
2 mounted within a light tight package.

1 24. An X-ray source, comprising:
2 an X-ray tube that emits X-rays via an X-ray window in response to a current control
3 signal, wherein said X-ray window includes an inside surface and an outside surface;
4 an X-ray detector that detects X-rays emitted from said X-ray window and provides a
5 detected X-ray signal indicative thereof; and
6 a controller that receives said detected X-ray signal and provides said current control
7 signal.

1 25. The X-ray source of claim 24, wherein said X-ray detector is located directly adjacent to
2 said outer surface.

1 26. The X-ray source of claim 24, wherein said X-ray detector is located directly adjacent to
2 said inner surface.

1 27. The X-ray source of claim 24, wherein said X-ray source is a battery powered device.

1 28. The X-ray source of claim 24, wherein said X-ray source is a handheld device.

1 29. The X-ray source of claim 24, wherein said X-ray device is configured for use as an X-
2 ray fluorescence analytical instrument.

1 30. The X-ray source of claim 27, wherein said detector is configured and arranged as a
2 segmented detector that includes a plurality of detector elements.

1 31. The X-ray source of claim 8, wherein said X-ray window is configured as an anode of
2 said X-ray tube.

1 32. An X-ray source, comprising:
2 means for generating X-rays in response to a control signal;
3 an X-ray detector that senses said X-rays and provides a detected X-ray signal indicative
4 thereof; and
5 a control system that receives said detected X-ray signal and a reference X-ray signal,
6 and provides said control signal.

1 33. The X-ray source of claim 32, wherein said control signal comprises a current control
2 signal.

1 34. The X-ray source of claim 32, wherein said reference signal is a time varying signal.